Supplemental Specification
2005 Standard Specification Book

SECTION 02786

OPEN-GRADED SURFACE COURSE (OGSC)

Delete Section 02786 and replace with the following:

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials and procedures for constructing OGSC.

1.2 RELATED SECTIONS

A. Section 01452: Pavement Smoothness

B. Section 02745: Asphalt Material

C. Section 02746: Hydrated Lime

D. Section 02748: Prime Coat/Tack Coat

1.3 REFERENCES

A. AASHTO T 30: Mechanical Analysis of Extracted Aggregate

B. AASHTO T 89: Determining the Liquid Limit of Soils

C. AASHTO T 90: Determining the Plastic Limit and Plasticity Index of Soils

D. AASHTO T 96: Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine

E. AASHTO T 104: Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

F. AASHTO T 112: Clay Lumps and Friable Particle in Aggregate

G. AASHTO T 176: Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test

H. AASHTO T 278: Surface Frictional Properties Using the British Pendulum Tester

I. AASHTO T 279: Accelerated Polishing of Aggregates Using the British Wheel

J. AASHTO T 304: Uncompacted Void Content of Fine Aggregate

K. AASHTO T 308: Determining the Asphalt Binder Content of Hot-Mix Asphalt (HMA) by the Ignition Method

L. AASHTO TP 61: Determining the Percentage of Fractured Particles in Coarse Aggregate

M. UDOT Quality Management Plans

N. UDOT Materials Manual of Instruction

O. UDOT Minimum Sampling and Testing Requirements

1.4 SUBMITTALS

A. Job mix gradation: at least 10 working days before paving.
   1. Submit materials and documentation in accordance with Materials Manual of Instruction, Section 954.
   2. Aggregate suitability test results.

B. Changes in job mix gradation:
   1. Submit a written request for a change in a job-mix gradation.
   2. Allow the Engineer five working days to review and approve the changes and to readjust the quantity of asphalt binder to be used.

C. Verification that Hydrated Lime meets the requirements of 02746.

D. Verification Asphalt Binder meets the requirements of 02745.

1.5 ACCEPTANCE

A. Acceptance sampling and testing of material is in accordance with UDOT Minimum Sampling and Testing Requirements.

B. A lot equals the number of tons placed during each production day.
   1. A lot is evaluated on the test results of four samples, with the following exceptions:
      a. If only three samples can be taken for the production day; compute incentive/disincentive using the test results from three samples.
      b. Add the lot to the next day's production if three random samples cannot be taken.
      c. Add the lot to the previous day's production for the last day's production if three random samples cannot be taken.
      d. When less than 900 tons are anticipated per production day, the lot may be increased to include up to three production days, when agreed upon in advance by both the Contractor and the Engineer.
      e. Evaluate with the appropriate number of tests "n" in Table 4:
   2. Asphalt Binder: Department will compute incentive/disincentive for asphalt binder content based on Table 1 using the single test result with the largest deviation from the target. AASHTO T 308.
      a. Apply incentive to the entire lot.
      b. Disincentive is applied only to the sublot (defined as percentage of the lot represented by the test).
      c. Any lot that includes one or more sublots in disincentive is not eligible for incentive
   3. Gradation: Department will compute incentive/disincentive for gradation is based on Percent Within Limits computation using Table 2, 3, 4, and 5. AASHTO T 30
      a. The Department will reject the lot if the Percent Within Limits is less than 60 percent.
   4. Any lot rejected based on either gradation or asphalt binder content will not be eligible for any incentive.

E. Thickness
   1. Verify the thickness with a depth probe and take corrective action if necessary.
      a. Minimum thickness: Plan depth minus ¼ inch.

F. Smoothness
   1. Determine acceptance and correct in accordance with Section 01452.

G. Submit an engineering analysis within one week, if requesting that a rejected lot or sublot remain in place.
   1. Include in the analysis: Data and engineering principles that indicate why the pavement should remain in place.
   2. The Engineer, Region Materials Engineer, and District Engineer review the analysis for acceptance, denial, or revision within three working days.
   3. If the request is denied, remove the rejected material from the project within 72 hours and replace it with an acceptable material.

4. If rotomilling is required, agree on removal time period.
5. Department deducts $20/ton if a rejected lot or sublot is allowed to remain in place.

Table 1

Incentive/Disincentive for Binder Content	
Binder Content	**Pay Adjustment in $/ton OGSC**
Within ± 0.30% of target	+1.00
Between ± 0.31% and ± 0.45% of target	0.00
Between ± 0.46% ± 0.60% of target	-2.00
Greater than ± 0.61%	Reject

Table 2

Gradation Upper and Lower Limit Determination	
Parameter	UL and LL
$^{3}/_{8}$ inch sieve	Target Value ± 6.0 percent
# 4 sieve	Target Value ± 6.0 percent
# 8 sieve	Target Value ± 5.0 percent
# 200 sieve	Target Value ± 2.0 percent

Table 3

Incentive/Disincentive for Gradation	
Gradation	
PT	**Incentive/Disincentive (Dollars/Ton)**
> 99	1.50
96-99	1.00
92-95	0.60
88-91	0.00
84-87	-0.26
80-83	-0.60
76-79	-0.93
72-75	-1.27
68-71	-1.60
64-67	-1.93
60-63	-2.27
<60	Reject

Table 4

Quality Index Values for Estimating Percent Within Limits										
PU/PL	**n=3**	**n=4**	**n=5**	**n=6**	**n=7**	**n=8**	**n=10**	**n=12**	**n=15**	**n=20**
100	1.16	1.50	1.75	1.91	2.06	2.15	2.29	2.35	2.47	2.56
99	1.16	1.47	1.68	1.79	1.89	1.95	2.04	2.09	2.14	2.19
98	1.15	1.44	1.61	1.70	1.77	1.80	1.86	1.89	1.93	1.97
97	1.15	1.41	1.55	1.62	1.67	1.69	1.74	1.77	1.80	1.82
96	1.15	1.38	1.49	1.55	1.59	1.61	1.64	1.66	1.69	1.70
95	1.14	1.35	1.45	1.49	1.52	1.54	1.56	1.57	1.59	1.61
94	1.13	1.32	1.40	1.44	1.46	1.47	1.49	1.50	1.51	1.53
93	1.12	1.29	1.36	1.38	1.40	1.41	1.43	1.43	1.44	1.46
92	1.11	1.26	1.31	1.33	1.35	1.36	1.37	1.37	1.38	1.39
91	1.10	1.23	1.27	1.29	1.30	1.31	1.32	1.32	1.32	1.33
90	1.09	1.20	1.23	1.24	1.25	1.25	1.26	1.26	1.27	1.27
89	1.08	1.17	1.20	1.21	1.21	1.21	1.21	1.21	1.22	1.22
88	1.07	1.14	1.16	1.17	1.17	1.17	1.17	1.17	1.17	1.17
87	1.06	1.11	1.12.	1.12	1.12	1.13	1.13	1.13	1.13	1.13
86	1.05	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
85	1.03	1.05	1.05	1.05	1.05	1.04	1.04	1.04	1.04	1.04
84	1.02	1.02	1.02	1.01	1.01	1.01	1.00	1.00	1.00	1.00
83	1.00	0.99	0.98	0.97	0.97	0.96	0.96	0.96	0.96	0.96
82	0.98	0.96	0.95	0.94	0.94	0.93	0.93	0.92	0.92	0.92
81	0.96	0.93	0.92	0.91	0.90	0.90	0.89	0.89	0.89	0.88
80	0.94	0.90	0.88	0.87	0.86	0.86	0.85	0.85	0.85	0.85
79	0.92	0.87	0.85	0.84	0.83	0.83	0.82	0.82	0.82	0.81
78	0.89	0.84	0.82	0.81	0.80	0.79	0.79	0.78	0.78	0.78
77	0.87	0.81	0.79	.0.78	0.77	0.76	0.76	0.75	0.75	0.75
76	0.84	0.78	0.76	0.75	0.74	0.73	0.72	0.72	0.72	0.72
75	0.82	0.75	0.73	0.72	0.71	0.70	0.69	0.69	0.69	0.68
74	0.79	0.72	0.70	0.68	0.67	0.67	0.66	0.66	0.66	0.65
73	0.77	0.69	0.67	0.65	0.64	0.64	0.62	0.62	0.62	0.62
72	0.74	0.66	0.64	0.62	0.61	0.61	0.60	0.59	0.59	0.59
71	0.71	0.63	0.60	0.59	0.58	0.58	0.57	0.56	0.56	0.56
70	0.68	0.60	0.58	0.56	0.55	0.55	0.54	0.54	0.54	0.53
69	0.65	0.57	0.55	0.54	0.53	0.52	0.51	0.51	0.51	0.50
68	0.62	0.54	0.52	0.51	0.50	0.50	0.48	0.48	0.48	0.48
67	0.59	0.51	0.49	0.48	0.47	0.47	0.46	0.45	0.45	0.45
66	0.56	0.48	0.46	0.45	0.44	0.44	0.43	0.42	0.42	0.42
65	0.53	0.45	0.43	0.42	0.41	0.41	0.40	0.40	0.40	0.39
64	0.49	0.42	0.40	0.39	0.38	0.38	0.37	0.37	0.37	0.37
63	0.46	0.39	0.37	0.36	0.35	0.35	0.35	0.34	0.34	0.34
62	0.43	0.36	0.34	0.33	0.33	0.33	0.32	0.31	0.31	0.31
61	0.39	0.33	0.31	0.30	0.30	0.30	0.29	0.29	0.29	0.28
60	0.36	0.30	0.28	0.27	0.26	0.26	0.25	0.25	0.25	0.25
<60	≤ 0.35	≤ 0.29	≤ 0.27	≤ 0.26	≤ 0.25	≤ 0.25	≤ 0.24	≤ 0.24	≤ 0.24	≤ 0.24

Enter table in the appropriate “number of tests” column and round down to the nearest value.

Table 5

Definitions, Abbreviations, and Formulas for Acceptance	
Term	**Explanation**
Target Value (TV)	The target values for gradation and asphalt binder content.
Average (AVE)	The sum of the lot's test results for a measured characteristic divided by the number of test results; the arithmetic mean.
Sample Standard Deviation (s)	The square root of the value formed by summing the squared difference between the individual test results of a measured characteristic and AVE, divided by the number of test results minus one.
Upper Limit (UL)	The value above the TV of each measured characteristic that defines the upper limit of acceptable production. (Table 2)
Lower Limit (LL)	The value below the TV of each measured characteristic that defines the lower limit of acceptable production (Table 2)
Upper Quality Index (QU)	QU = (UL - AVE)/s
Lower Quality Index (QL)	QL = (AVE - LL)/s
Percentage of Lot Within UL (PU)	Determined by entering Table 4 with QU.
Percentage of Lot Within LL (PL)	Determined by entering Table 4 with QL.
Total Percentage of Lot (PL) Within UL and LL (PT)	PT = (PU + PL) - 100
Incentive/Disincentive	Determined by entering Table 3 with PT or PL.

All values for AVE, s, QU, and QL will be calculated to at least a two decimal place accuracy which will be carried through all further calculations. Rounding to lower accuracy is not allowed.

PART 2 PRODUCTS

2.1 ASPHALT MATERIAL

A. As specified, in Section 02745.

B. Sampling procedure: UDOT Quality Management Plan - 509 Asphalt Binder.

2.2 HYDRATED LIME

A. Meet the requirements of Section 02746.

2.3 AGGREGATE MATERIALS

A. Crusher processed virgin aggregate material consisting of crushed stone, gravel, or slag.

B. Meet the following requirements, including Table 6, to determine the acceptability of the aggregate.
   1. Coarse aggregate:
      a. Retained on # 4 sieve.
   2. Fine aggregate:
      a. Clean, hard grained, and angular.
      b. Passing the # 4 sieve.

Table 6

Aggregate Properties		
Properties	**Test Method**	**Test Requirement**
One Fractured Face	AASHTO TP 61	95 percent min.
Two Fractured Face	AASHTO TP 61	90 percent min.
Fine Aggregate Angularity	AASHTO T 304	45 min.
Flakiness Index	UDOT MOI 933	20 % max.
L.A. Wear	AASHTO T 96	30 % max.
Sand Equivalent	AASHTO T 176	60 min.
Plasticity Index	AASHTO T 89 and T 90	0
Polish Test	AASHTO T 278 & T 279	31 min.
Soundness (sodium sulfate)	AASHTO T 104	12 % max. loss with five cycles
Clay Lumps and Friable Particles	AASHTO T 112	2 % max.
Natural Fines	None	None

2.4 JOB-MIX

A. Obtain Engineer's approval for job mix gradation:
   1. Show definite single values for the percentage of aggregate passing each sieve based on the dry weight of aggregate.
   2. Stay within the single value gradation limits of Table 7.
   3. Incorporate minimum hydrated lime by dry weight of aggregate into all mixtures. Refer to Section 02746:
      a. Method A, Lime Slurry incorporate 1 percent
      b. Method B, Lime Slurry Marination incorporate 1½ percent

B. Binder Content
   1. The Engineer determines the binder content. MOI Section 954.

Table 7

Aggregate Gradation (Percent Passing by Dry Weight of Aggregate)	
Sieve Size	**Percent**
½ inch	100
$^3/_8$ inch	90 - 100
# 4	35 - 45
# 8	14 - 20
# 200	2 - 4

PART 3 EXECUTION

3.1 MIXING

A. Mix until all particles are coated.

B. Treat aggregate with hydrated lime in accordance with the requirements of 02746.
   1. When using Method A, verify lime slurry equipment is operating at all times.
      a. Cease production if hydrated lime slurry treatment is interrupted.
      b. Engineer may require marination of the aggregate/hydrated lime mixture in the stockpile, Method B, if production continues without hydrated lime slurry treatment.

3.2 SURFACE PLACEMENT

A. Apply the tack coat at a uniform rate. Refer to Section 02748.
   1. 0.10 gal/yd^2 on new pavement
   2. 0.15 gal/yd^2 on milled surfaces

B. Maintain a steady paver speed

C. Roll sufficiently to seat without fracturing aggregate.

D. Bring all passes up even transversely at the end of each working day.

E. Construct longitudinal joints within 6 inches of lane lines.

F. Remove slick spots as directed by the Engineer.

3.3 LIMITATIONS

A. Place between May 1 and September 15.
   1. Obtain written approval from the Engineer before placing OGSC after September 15.

B. Place when the air temperature in the shade and the pavement surface temperature are above 60 degrees F and rising.

C. Do not place if surface moisture is present.

D. Do not place during rain or during other adverse weather conditions.

END OF SECTION